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ABSTRACT

During the year 2000, 1,737 students were randomly selected to represent 231,000 students participating in 1,350 JROTC programs in three regions of the United States. The intention of this study was to identify whether a dominant learning style preference would be revealed for this student population as compared to the learning style of the general population of high school students. Also examined were the following: variations in gender and ethnicity patterns that might contribute to the shaping of policies and programs to achieve the JROTC mission more effectively; whether a unique learning style characterized the instructors who worked with JROTC students and how their styles compared to the general population of secondary instructors; and whether gender or ethnic differences in learning styles existed within the group of participating JROTC instructors. Based on findings an analyses of both JROTC students' and instructors' learning style portraits, recommendations were developed for enhancing curriculum and instruction for JROTC students in harmony with the implementation of strategies and program course content initiated by Cadet Command. An overview of the Dunn and Dunn Learning-Style Model is provided. Includes two tables and three figures. An appendix lists instruments for identifying learning style, with grade/training level. (Contains 190 references.) (AEF)

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Learning-Style Characteristics of JROTC Cadets and Instructors: Implications for Training and Instruction

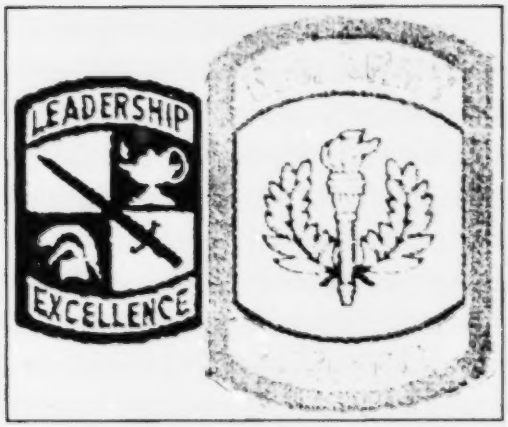
by

Rita Dunn
St. John's University

Andrea Honigsfeld
Molloy College

and

Laurence D. Martel
National Academy of Integrative Learning Inc.



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EXECUTIVE SUMMARY

According to the research, there are many strategies one can implement to improve student-learning performance. But the one area of research, which holds the most promise in documenting high student outcomes is in the field of Learning Styles. Knowing how JROTC instructors and cadets learn best and knowing how to use Learning Styles information to dramatically improve the learning environment is the focus of this study.

During the year of 2000, 1,737 students were randomly selected to represent 231,000 students participating in 1,350 JROTC programs in three regions of the United States. Our intention was to identify whether a dominant learning-style preference would be revealed for this special student population as compared to the learning style of the general population of high school students. We also examined variations in gender and ethnicity patterns that might contribute to the shaping of policies and programs to achieve the JROTC mission more effectively. Furthermore, we were interested in identifying whether a unique learning-style characterized the instructors who worked with JROTC students and how their styles compared to the general population of secondary instructors. We also sought to determine whether gender or ethnic differences in learning styles existed within the group of participating JROTC instructors.

Based on our findings and analyses of both JROTC students' and instructors' learning-style portraits, we developed recommendations for enhancing curriculum and instruction for JROTC students in harmony with the implementation of strategies and program course content initiated by Cadet Command.

As you read this report, you will learn about the concept "Learning Style" and how significant it is in presenting new and difficult information to cadets. You will also learn how people perceive and process information differently from each other. In addition, a survey of meaningful research findings on adolescents is presented to you, along with related research on "at-risk" students. Moreover, you will learn about the general population of high school students, against which the sample JROTC population was compared. Differences in gender and ethnicity are discussed in accordance with our literature review. An overview of the "Dunn and Dunn Learning - Style Model" is provided for your review and understanding.

The benefits from this research and future training in the Learning- Style Model, combined with implementing the newly revised curriculum and innovative instructional-learning tools, could dramatically increase individual JROTC performance by:

- improving recruiting,
- reducing drop out rates,
- increasing graduation rates,
- obtaining higher grades and grade point averages in "other" classes,
- developing stronger persistence from freshman year to graduation,
- strengthening self esteem,
- creating self-directed learning,
- expanding joy and enthusiasm for learning,
- broadening instructor capability and confidence,
- raising achievement standards,
- increasing leadership participation among male and female cadets.

Over the past thirty-five years, the Dunn and Dunn Learning- Style Model, which consists of four phases of strategic improvement processes, has been internationally validated and utilized by 116 institutions of higher education. The Model has won over 40 national and international doctoral dissertations awards proving the strength and predictability of students' increased achievement when taught through learning styles strategies.

The four phases of the Dunn and Dunn Model are consistent with the Deming Quality processes for leadership and consist of:

Phase 1. Assessment Inventories and Strategies
Phase 2. Planning and Diagnostic Processes

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Phase 3. Implementation Strategies, Tactics and Tools
Phase 4. Verification, Assessment, Evaluation and Research

This research project was limited to phase 1, although related activities from Cadet Command on instructional design, training and support follow the general topics in phases 2, 3 and 4. Based on this research project it is both recommended and anticipated that further training on specific learning style strategies, processes, tactics and tools be conducted. This research addressed the following questions:

"With respect to cadets, do they have different learning styles than reported in the general population of high school students; is there a difference in learning style by gender among cadets; are there differences in learning style among varying ethnic groupings?"
"With respect to JROTC instructors, do they have different learning styles than the general population of high school teachers; do instructors have a variance in learning style according to gender; does the instructor profile differ according to ethnicity?"

As a general summary, we discovered several significant findings which are of value to every JROTC instructor. However, the implications of the findings are discussed in the full document.

JROTC cadets differ from other high school students on five learning style characteristics, which bear directly on facilitating higher achievement.

Male and female cadets differed from each other on eleven variables. (This might help explain why females emerge to leadership positions and what to do about fostering equity.)

Nine different variables affect JROTC as it relates to African Americans, Asian Americans, Caucasian Americans, Hispanic Americans, and Native Americans.

Instructors in JROTC differed on eight variables, compared with the general population, including the need for "less" mobility; whereas, cadets need or prefer more mobility when learning new and difficult information.

How JROTC instructors process and internalize learning can significantly impact the outcomes of regional and cadet command training programs, as well as distance learning activities.

Instructor Learning Styles are more in common with female cadet learning styles and less in common with male learning styles raising questions about approaches and expectations in cultivating leadership.

As depicted in this report, specific learning style characteristics were unique to both JROTC instructors and cadets as compared to the general population of students and teachers. Also, there were many similarities within and between groups of cadets and instructors. To capitalize on these significant findings, this report should serve as the basis for expanding current instructors' knowledge of their JROTC cadets' learning styles and how to base their instructional environments and methods to achieve high student performance.

LDM, Hilton Head Island
South Carolina
November, 2001

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by

Rita Dunn
St. John's University

Andrea Honigsfeld
Molloy College

and

Laurence D. Martel
National Academy of Integrative Learning Inc.

RITA DUNN, Ed. D., is professor, Division of Administrative and Instructional Leadership, coordinator, Instructional Leadership Doctoral Program, and director, Center for the Study of Learning and Teaching Styles, St. John's University, New York.

ANDREA HONIGSFELD, Ed. D., is assistant professor, Graduate Division of Education, Molloy College, Rockville Centre, New York.

LAURENCE MARTEL, Ph. D. is President, National Academy of Integrative Learning, Inc.

Abstract

This manuscript is based on a synthesis of the National Academy of Integrative Learning's Research Report Prepared for the Junior Reserve Officer Training Corps Cadet Command in Fort Monroe, Virginia (Honigsfeld, Martel, Price, & Dunn, 2001). It explains the construct of learning style and describes the styles of a cross-section of both JROTC cadets and their instructors. In addition, based on these overall JROTC data reflected against a background of adult patterns gleaned from a national database, instructional strategies are suggested for increasing the effectiveness of cadet training.

SECTION I.
Background on Learning Style Research and JROTC

Although high school instructors face many challenges when preparing their students for the recently expanded local and state graduation requirements, their current problems may be no worse than in previous decades. American minority students always have reflected widely diverse populations who speak multiple languages and evidence substantially fewer skills than their instructors believed necessary for academic success
(Dunn & Stevenson, 1997).

Many adolescents and young adults are less motivated than necessary for attending to, and maintaining interest in, the standard curriculum during five consecutive hours each day, five days each week. That single trait—low motivation toward academic studies, has contributed substantially to students' discontent and school failure (Dunn & Dunn, 1993, 1999). Interestingly, most children are eager to learn when they first enter kindergarten. Sadly, the more years they remain in school, the less motivated they become.

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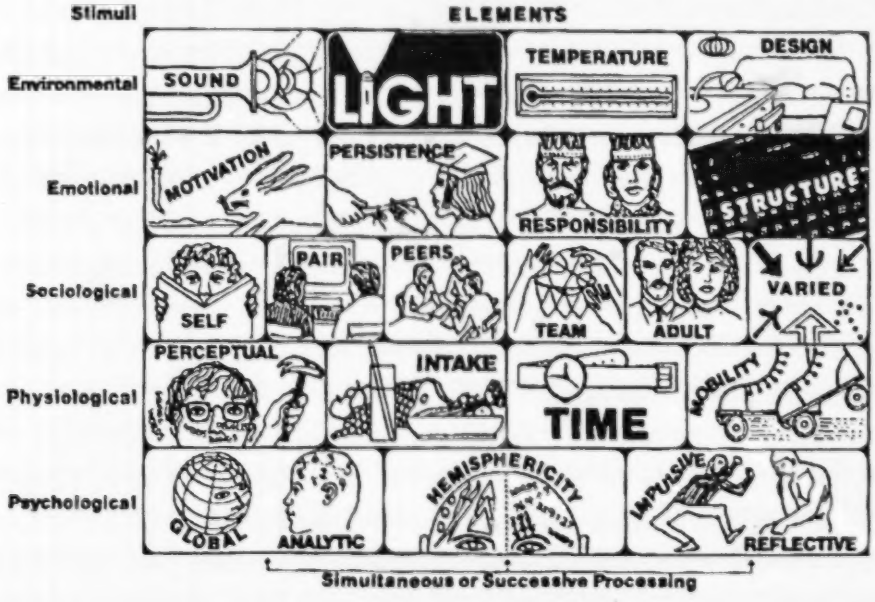
Decreasing student motivation is an unfortunate and unnecessary condition today. Three decades of research has documented that, when students were taught with instructional approaches that complemented their learning styles, they achieved statistically higher standardized achievement- and attitude-test scores than when they were taught traditionally (Dunn & DeBello, 1999). Decreased motivation appeared to be the result of dissonance between how teachers taught and how their students learned—their individual learning styles (Dunn, Thies, & Honigsfeld, 2001). That extensive research indicates that learning style-responsive instruction is likely to be the cornerstone for improving JROTC cadets' academic achievement.

What is Learning Style?

Learning style is the way each person begins to concentrate on, process, internalize, and remember new and difficult academic information (Dunn & Dunn, 1993; Dunn & Dunn, 1999; Dunn & Griggs, 2000). A comprehensive learning-style model was developed and gradually expanded by Professors Rita and Kenneth Dunn during a 35-year period of intensive research beginning in the late 1960s. The Dunn and Dunn Model, as their work became known, has been internationally recognized for its extensive research, the predictive validity of its instruments for correctly identifying learning style, and its effectiveness in producing significantly increased student gains among poorly achieving K-12 students in urban, suburban, and rural areas (see Dunn & DeBello, 1999; Research on the Dunn and Dunn Model, 2001, www.learningstyles.net).

Figure 1. **The Dunn and Dunn Learning-Style Model**



The Dunn and Dunn Model has served as the basis of at least 800 publications based on correlational and experimental studies conducted by researchers at more than 116 institutions of higher education. At St. John's University in New York, researchers have received more than 40 national and international awards because of the quality of their investigations with this model. This model incorporates 21 elements that tend to correlate with academic achievement for people.

According to the Dunns (1993, 1999), learning style is divided into five major strands called *stimuli*. Its stimulus strands include: (a) environmental, (b) emotional, (c) sociological, (d) psychological, and (e) physiological elements that significantly influence how many individuals learn (see Figure 1).

The *Environmental* strand incorporates individuals' preferences for the elements of Sound, Light, Temperature, and furniture or seating Design. The *Emotional* strand focuses on students' levels of Motivation, Persistence, Responsibility, and need for Structure. The *Sociological* strand addresses students' preferences for Learning Alone, in Pairs, with Peers, as part of a Team, with either Authoritative or Collegial instructors, or in Varied approaches as opposed to in patterns. The *Physiological* strand examines Perceptual

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Strengths (visual, auditory, tactual, or kinesthetic), Time-of-Day energy levels, and the need for Intake and Mobility while learning. Finally, the *Psychological* strand incorporates the information-processing elements of global versus analytic, and impulsive versus reflective behaviors.

Everyone has a learning style and everyone has learning-style strengths. It is easier to learn through strengths than it is to learn through weaknesses. **Unfortunately, when instructors teach an entire class in exactly the same way, some students are being taught through their strengths at the same time that others are being taught through their weaknesses.**

Instructors recognize that their students learn differently from each other. They just don't know how to teach students with very different learning styles in the same class at the same time. Instructors should know how, but neither they, their supervisors, nor many of the professors who teach them how to teach, remain current with research. **In addition, many people find it easier to do things the way they always have done them, rather than do them differently.**

People learn in different settings. Because most classrooms look like every other classroom, people assume that everyone can learn in that kind of setting. Some people do, but many more do not! Researchers involved with learning styles have known this since the early 1980s (Braio, Dunn, Beasley, Quinn, & Buchanan, 1997; Krimsky, 1982; DeGregoris, 1986; DellaValle, 1984; Dunn, Della Valle, et al., 1986; Hodges, 1985; Miller, 1985; Pizzo, 1982; Shea, 1983; Sullivan 1999).

People feel differently about learning new and difficult academic information. Because most students behave as required in school, people assume that students can do what their instructors require and like learning that way. They do not realize that many people find it difficult to learn:

- for long periods of uninterrupted time. Those people think more clearly with several short assignments interspersed with breaks during which they can relax intermittently;
- required subject-matter content when it has little meaning for them and their lives, and often seems boring and uninteresting;
- in exactly the same position and place for an entire period. Instead, these people need periodic mobility and the freedom to move from one space to another without distracting others;
- when they have to do what someone else prescribes without input or choice; and
- as their instructors teach, whether or not it is difficult.

People feel differently about with whom they learn. Successful students in traditional classes rarely interact with their classmates while learning. Instead, they usually learn directly from either their instructors or their books. Many enjoy learning from instructors, but others prefer learning independently by themselves. Some students either enjoy learning with a friend or two or in a small group of three or four. And some like a little of everything—sometimes alone, sometimes with a friend, sometimes in a group, and sometimes with their instructor. On the other hand, many people have only one favorite way of learning and cannot remain in focus any other way. With whom individuals learn most enjoyably and efficiently is called their sociological preferences.

People remember new and difficult information through different perceptual modalities. **Although all instructors teach by talking, learning-by-listening is the most difficult way for most people to remember new and challenging information—particularly facts.**

- Some people learn by reading.
- Many learn better from cartoons, graphs, pictures, photographs, diagrams, or transparencies than they do from printed words or numbers.
- Some people are actually low- or non-visual learners; they may be good readers, but they often get to the end of a page and think to themselves: "What did I read?" They then have to go back and read the same material over again!
- Combinations of listening and reading are effective for some who learn well from films, movies, or videotapes

because of their multimedia appeal. On the other hand, there are many learners for whom multimedia (combined auditory and visual) teaching is distracting. These learners find it difficult to focus on more than one stimulus at the same time and perform well with only singular input.

• **Most instructors are unaware that at least 30% of their students are unable to remember at least 75% of what they either hear or see.** Some of these learners remember well when they learn with their hands (tactually) and/or their bodies ("kinesthetically" or experientially—through movement). Such students often dislike (and fail in) school because they are required to sit still and listen instead of being allowed to learn by doing—through active engagement. You may wonder how people can learn mathematics, language, or science tactually or kinesthetically. That's part of what this report will explain!

People learn at different times of the day or night. Time-of-day directly impacts on many people's ability to learn. Some are most alert in the morning or evening, others in the late morning or afternoon. **People have to work a lot harder to be successful at their wrong time of day than they do at their best time of day!**

People process difficult information differently. Some people pay attention to details—such as facts and isolated bits of information. When told that they are required to remember specific things, they can remember unrelated data that have little to do with their interests or lives. Such people are called, *analytic* learners. Because rote memorization often is necessary in traditional schools, motivated analytics tend to perform well there.

Global learners are as intelligent and capable as analytics, but they resist learning when facts are neither interesting nor related to them personally. Globals do not concentrate, process, internalize, or remember new and difficult information unless they become interested in what they are learning.

Global learners respond well to mastering new information when it is presented:

• in a short story or anecdote;
• in ways that relate it to their lives, experiences, or interests;
in small doses;
• with humor;
• in a game-like approach;
with illustrations, pictures, photographs, or comics;
• in a collegial pair, team, or group;
• colorfully or dramatically; and
• in ways that actively involve them.

People's processing styles interact differently with different perceptual strengths. Interactions often seem to occur between individuals' processing styles—analytic versus global—and their perceptual strengths—auditory, visual, tactual, or kinesthetic. Therefore, it is important to know how you process most easily and through which modality you tend to remember best.
(see Figure 2 pg. 5)

The Junior Reserve Officer Training Corps' Program

To help students reduce their vulnerability to academic failure and dropping out of school, Congress established the national Junior Reserve Officer Training Corps (JROTC) Program in 1916. Fifty-two years later, in 1972, after it became more widely acceptable to educate both genders, the program was opened to young women.

Since the 1964 JROTC Vitalization Act, the program has been taught by former military personnel at high schools nationwide. *Innovative efforts to improve instruction have occured in the recent past with the opportunity in the future to expand instruction capability through training and experience in identifying and teaching to their cadet's learning styles.*

Goals and Objectives

The JROTC program was designed to teach citizenship and leadership while, simultaneously, instilling self-esteem, discipline, and the ability to engage in teamwork among high school students. The focus of the Army JROTC program was reflected in its mission—*to motivate young people to be better citizens.*

Figure 2. Complementary interactions between individuals' processing style and perceptual strengths

PERCEPTUAL STRENGTHS				
PROCESSING STYLE	**AUDITORY**	**VISUAL**	**TACTUAL**	**KINESTHETIC**
	Remembers:	Remembers:	Remembers:	Remembers:
ANALYTIC	By Repeating Words or Numbers Either Internally or Externally	By Reading, Seeing, or Observing	By Writing or Note Taking	When Rocking, Walking, Running, or Jogging While Concentrating
GLOBAL	With Music, Poetry, or Lyrics	By Viewing Incidents or Multi-Media	By Doodling, Drawing, or Mapping	When Engaged in Experiential Learning, Drama, or Simulations

> The stated purpose of the program is: To instill in students in the United States secondary institutions the values of citizenship, service to the community and to the United States, personal responsibility, and a sense of accomplishment. (Army Cadet Command, 2000, p.1)

Why Identify the Learning Styles of Students in the Junior Reserve Officer Training Corps' Program?

Hundreds of correlational studies have revealed that multiple learning styles exist among every group of secondary-school students (Research on the Dunn and Dunn Model, 2001). Regardless of the students examined, some are analytic, many are global; some prefer a quiet, well-lit, conventional environment in which to study; whereas others concentrate better with background music or conversation, soft lighting and comfortable seating with snacks available; some are persistent and others need breaks; some learn well from a instructor; many learn better independently or with a friend or two; some require multisensory instructional resources, but others find a single media crucial for their understanding *(See Table 1, p. 22).*

Beyond the recognition that different learning styles exist in every classroom, extensive experimental research repeatedly has documented statistically higher standardized test scores for students taught with strategies that responded to their learning-style strengths in contrast to when those same learners were taught with strategies that were contrary to their learning styles *(See Table 2, p.23).* Tables 1 and 2 represent only a small sampling of the documentation that shows the comparative impact of learning-style responsive versus non-learning-style responsive teaching. Nevertheless, *no previous researchers examined whether learning styles could be capitalized on to better meet JROTC objectives for high-school students.* Furthermore, *no previous researchers measured the degree to which JROTC instructors' styles were similar to, and different from, those of their students.* Nor have previous researchers considered whether identifying and analyzing JROTC cadets' learning styles, and then providing instruction based on those identified strengths, would yield significantly higher achievement- and attitude- test scores than when their instructors teach based on perceptions of appropriate

strategies for teaching a specific *topic* rather than a specific *student.*

The Dunn and Dunn Learning-Style Model

When designing this landmark study for JROTC, the Dunn and Dunn Learning-Style Model was selected because it:

1. is one of only two currently existing comprehensive learning-style models;
2. is supported by national and international studies conducted by researchers at more than 116 institutions of higher education (Research on the Dunn and Dunn Model, 2001);
3. has been used successfully with general and special education students in all subject areas—preschool through high school;
4. documented repeatedly that instruction responsive to students' learning-style strengths resulted in statistically higher standardized achievement and attitude test scores (Dunn & Dunn, 1992, 1993, 1999; Research on the Dunn and Dunn Model, 2001);
5. provides the basis for a practical, diagnostic-prescriptive approach;
6. has age-appropriate instruments that have been reported as both valid and reliable (Curry, 1987; DeBello, 1990; Tendy & Geiser, 1998/1999);
7. provides easy-to-follow, hands-on guidelines for both instructors and students to follow;
8. provides printed prescriptions for studying and doing homework through individual students' learning-style strengths; and
9. includes a practical, hands-on series of directions that enable students to learn how to teach themselves (Brand, 1999; Dunn, in press; Dunn, Deckinger, Withers, & Katzenstein, 1990; Geiser et al., 2000-2001; Lenehan et al., 1994).

Related Literature

Research on the Dunn and Dunn Learning-Style Model spans 35 years of examining pre-school, elementary, secondary, undergraduate, graduate, and corporate learners to determine the effects of alternative approaches on their achievement, attitudes-toward learning, behaviors, and personalities in learning-style versus non-learning-style instructional environments Research on the Dunn and Dunn Model, (2001). These data are available on www.learningstyles.net.

Effects of Learning-Style Responsive Instruction on Special Education Students

According to the Center for Research in Education (CRE), the 20-year period of extensive federal funding (1970-1990) produced very few programs that consistently resulted in statistically higher, standardized-achievement test scores for classified Special Education students. Prominent among those programs that did impact significantly on these students' reading and mathematics scores was the Dunn and Dunn Learning-Style Model (Alberg et al. 1992). CRE's researchers visited schools, obtained decades-old records, interviewed former staffs, and examined achievement data concerning the effect of federal funding over two decades. They consistently found significant impact among Special Education students in schools that had implemented the Dunns' learning-style approaches (Alberg et al.; Braio et al., 1997; Brunner & Majewski, 1990; Dunn, Bruno, Sklar, & Beaudry, 1990; Dunn & DeBello, 1999; Dunn, Della Valle, et al., 1986; Klavas, 1994; Stone, 1992).

In June, 1987, prior to the implementation of learning style, **only 25 percent of the mildly-handicapped students in Frontier's Central High School District in Hamburg, New York had passed the State Competency Tests to receive diplomas. During 1987-1988, the *first* year that learning style-based instruction was introduced, that number increased to 66 percent. During 1988-1989, the *second* year, 91 percent of the Special Education high school students were successful.** Indeed, that year, a greater ratio of *handicapped* students passed the State Competency Tests than regular education students (Brunner & Majewski, 1990).

During the 1999-2000 school year, New York's State Education Department (NYSED) increased requirements for high school gradua-

tion. Officials mandated that all students—including those in Special Education, had to pass the State's Regents Tests or forfeit a diploma. Special Education instructors and administrators statewide expressed serious concerns about the dire implications of that requirement for classified students. However, in February of 2001, Frontier's Director of Special Education, Dorothy Robertson, who had trained all its instructors to use the Dunn and Dunn learning-style approaches, was notified by NYSED that, of the district's students with disabilities:

- 89 % had passed the Regents Comprehensive Language Exam
- 100% had passed the Regents English Exam
- 90% had passed the Regents History and Government Exam
- 96% had passed the Regents 1 Math Course
- 77% had passed the Regents Biology Exam
- 73.3% had passed the Regents Global Studies Exam and
- 20% had passed the Regents Math Course 111.

New York State's Buffalo City Schools' elementary and secondary instructors also experimented with the Dunns' learning-style approaches. After only one year of learning-style implementation, supervisors reported significantly increased standardized achievement-test scores among Buffalo's Special Education students who had been randomly assigned to an Experimental Group versus the scores of their counterparts in a Control Group (Dunn & DeBello, 1999; Kyriacou & Dunn, 1994; The Buffalo Experience, 1993).

Effects of Learning-Style Based Instruction on General Education Students

A meta-analysis of 42 experimental studies conducted at 13 different universities with the Dunn and Dunn Learning-Style Model between 1980-1990, revealed that eight variables coded for each study produced 65 individual effect sizes (Dunn, Griggs, Olson, Gorman, & Beasley, 1995). The overall, unweighted group effect size value (r) was .384 and the weighted effect size value was .353 with a mean difference (d) of .755. Referring to the standard normal curve, this suggests that students whose learning styles were accommodated, could be expected to achieve *75% of a standard deviation higher than students who had not had their learning styles accommodated.* This indicated that matching students' learning-style preferences with educational interventions compatible with those preferences was beneficial to their academic achievement.

Among the Dunns' learning-style instructional approaches were several alternative strategies for teaching the identical academic information differently to different students. Researchers demonstrated that, students enrolled in middle-school general music courses evidenced: (a) very different learning styles; (b) significantly different short- and long-term memory scores with traditional teaching and innovative Learning Styles tools, such as, Contract Activity Packages (CAPs), and Programmed Learning Sequences (PLSs) (Gremli, 2001-2002); and significant correlations between various learning-style elements and achievement in lessons taught through each of the instructional methods. Similar results occurred repeatedly when using Learning Styles tools, such as, CAPs (Brown, 1991; Dunn, 1997; Dunn & Gremli, 1998/99; Gremli, 1999; Lefkowitz, 1998, 2001; Pfleger Dunham & Lewthwaite, 2000; Russo, in progress; Santano, 1998), PLSs (Boyle & Dolle, 2001; Listi, 1999), and other Learning Styles tools, such as Multisensory Instructional Packages (Gardiner, 1986; Hamlin, 2001; Schiering, 1999; Taylor, 1999) at all levels.

Practitioners' Reports of Learning-Style Based Instruction Across the Nation

Practitioners throughout the United States have reported statistically higher standardized achievement- and attitude-test scores after implementing the Dunn and Dunn model. Those gains were documented for poorly- and highly-achieving students *in urban, suburban, and rural schools* (Andrews, 1990; Boyle & Dolle, in press; Brunner & Majewski, 1990; Dunn & DeBello, 1999; Elliot, 1991;

Gadwa & Griggs, 1985; Geiser et al., 1999; Gremli, 2001-2002; Hamlin, 2001; Klavas, 1993; Koshuta & Koshuta, 1993; Lefkowitz, 2001; Lemmon, 1986; Mickler & Zippert, 1987; Miller, 1997; Neely & Alm, 1992, 1993; Nelson et al., 1993; Orsak, 1990; Quinn, 1996; Stone, 1992; The Buffalo Experience, 1993) at all educational levels.

Correlational Research on Learning-Style Differences

Learning Styles and At-risk Students

Griggs and Dunn (1988) summarized the findings of three major studies that examined the learning-style characteristics of at-risk, high school students or dropouts compared to students not at-risk. In the three studies conducted by Gadwa and Griggs (1985), Johnson (1984), and Thrasher (1984), dropouts were self-motivated and reported a strong need for mobility, learning in several ways (needing a variety of approaches), and studying in the evening. In addition, most of them required an informal learning environment, soft lighting, and auditory, (but not visual), tactual, or kinesthetic (active bodily involvement such as when using role playing, case studies, or on-the-job training) approaches to learning new and difficult material. The authors recommended focusing on students' learning-style strengths to increase the number of teenage graduates.

Nations-Miller (1993) determined similarities and differences in learning styles among groups of at-risk, gifted, and vocational students in an urban Atlanta high school. This group of at-risk students was low on responsibility, indicating that they were non-conforming. They disliked learning auditorially, visually, and tactually (but did learn kinesthetically), and were not parent motivated. They also preferred sound, bright light, learning in the late morning, and frequent mobility while concentrating.

Conversely, gifted students were highly parent-motivated and kinesthetic. They required neither mobility nor bright light and disliked learning visually and tactually but enjoyed learning auditorially and kinesthetically.

Differences by Gender

Research conducted with elementary and secondary student populations revealed that males and females often had distinct physiological, perceptual, sociological, and emotional learning-style attributes. Male students tended to be more visual, tactual, or kinesthetic; generally, females were more auditory (Dunn, 1996). Marcus (1979) found that female students were more conforming, authority-motivated, and parent- or self-motivated than their male classmates. On the other hand, males were more instructor-motivated and preferred to work alone. Yong and McIntyre (1992) confirmed that an *informal classroom environment* that encouraged *active learning and mobility* had more appeal for male than for female students. Few students preferred learning by listening or reading as opposed to **active involvement**. Pizzo, Dunn, and Dunn (1990) found that females needed significantly more quiet than males when learning new and difficult information. Jenkins (1991) also substantiated that female preferences were significantly different from male preferences for motivation, persistence, structure, authority motivated, and kinesthetic learning. **This research should be valuable when developing JROTC initiatives and program strategies designed to groom leaders from both male and female cadets nationwide.**

Differences by Ethnicity

Griggs and Dunn (1994, 1995, 1996) summarized correlational findings for the five major cultural groups within the United States. Significantly different learning-style preferences were revealed between—and within—each group.

African Americans.

African American students often demonstrated a pattern of field dependent information processing[1]. "Field independent learners tend to be highly analytic and systematic; field dependent learners [tend to be] more holistic" (Keefe, 1987, p.17). Field independents often preferred a quiet, informal learning environment with soft lights and casual seating. During their early school years, they tended to be adult motivated and persistent, and needed intake, mobility, and learning in the

afternoon or evening.

[1]Field independence vs. field dependence indicates a continuum of analytic, as opposed to a non-analytic (or *global*) way of experiencing thoughts in a particular environment. Field Independents perceive things apart from their backgrounds, whereas Field Dependents are influenced by the overall organization of the background field and see parts of it as fused or belonging together. Field Independents differentiate among their experiences as being unique and often unrelated; Field Dependents perceive of them as integrated with their own lives and, if the experience has no relationship to them personally, it seems unnecessary or unworthy of cognitive effort.

Asian Americans. Significant numbers of Asian-American students were highly motivated and persistent and preferred (a) analytic, field independent information processing, (b) a brightly lit, formal learning environment, (c) structure, (d) varied sociological patterns, and (e) long concentration intervals—late morning, afternoon or evening hours for studying new and difficult materials.

Caucasian Americans. Larger than average numbers of Caucasian American students preferred (a) analytic, sequential, field independent information processing. Cognitive or information processing refers to a learner's ability or bias for processing information either (a) in a step-by-step, linear fashion or simultaneously by integrating the separate elements of an experience into a whole (Keefe, 1987); (b) an informal or formal environment, (c) working independently rather than in groups, and/or (d) with mobility and intake.

Hispanic Americans. In general, many Hispanic American students' learning characteristics revealed the following common traits: (a) field dependent processing style, (b) preference for a cool, informal learning environment, (c) a strong need for structure, (d) peer-motivated learning, (e) late morning or afternoon energy peaks, (f) a kinesthetic perceptual strength, and (g) a need for variety as opposed to routines and patterns.

Native Americans. On the whole, Native American students revealed (a) global or simultaneous processing-style preferences, (b) need for a cool, formal environment, (c) low levels of persistence, (d) low energy levels in the afternoon, (e) strong peer motivation, and (f) a low preference for auditory learning. Griggs and Dunn (1994) concluded that, **although there are distinctive differences between groups, differences within each group's learning characteristics were just as pronounced.**

To respond to these multiple variations among different ethnic groups and the varied learning styles within each group, Dunn and Stevenson (1997) proposed that learning-style responsive instruction held promise for addressing the special needs of underachieving and minority students. Therefore, Cadet Command policies and programs that train instructors and provide cadets with instructional strategies, tactics, tools and content to support respect for individual learning styles should significantly improve JROTC outcomes.

Research Questions

In the beginning of 2000, 1,737 students were randomly selected to represent 231,000 students participating in 1,350 JROTC programs in three regions of the United States. Our intention was to identify whether a dominant learning-style preference would be revealed for this special student population as compared to the learning style of the general population of high school students. We also examined variations in gender and ethnicity patterns that might contribute to the shaping of policies and programs to achieve the JROTC mission more effectively. Furthermore, we were interested in identifying whether a unique learning-style characterized the instructors who worked with JROTC students and how their styles compared to the general population of secondary instructors. We also sought to determine whether gender or ethnic differences in learning styles existed within the group of participating JROTC instructors.

Based on our findings and analyses of both JROTC students' and instructors' learning-style portraits, we developed recommendations for enhancing curriculum and instruction for JROTC students in harmony with the implementation of strategies and program

course content initiated by Cadet Command.

We sought answers to six questions. With reference to the JROTC student population, we were interested in the following information.

1. Do JROTC students' learning-style preferences differ from those of the general population? If so, how do they differ?
2. Do JROTC students' learning-style preferences differ by gender? If so, how do they differ?
3. Do JROTC students' learning-style preferences differ by ethnicity? If so, how do they differ?

With reference to the JROTC instructors, we were interested in the following information.

4. Do JROTC instructors' learning-style preferences differ from those of the general population? If so, how do they differ?
5. Do JROTC instructors' learning-style preferences differ by gender? If so, how do they differ?
6. Do JROTC instructors' learning-style preferences differ by ethnicity? If so, how do they differ?

Population, Instrumentation, and Research Design

Population and Sample

The population for this study included 231,000 cadets from 1350 JROTC Programs distributed throughout the United States. The sample consisted of 1,737 students ranging in age from 16-19. It included 499 African Americans, 72 Asian Americans, 726 Caucasian Americans, 264 Hispanic Americans, 19 Native-Americans and 157 students identified their ethnicity as other.

The sample for this study also included 233 JROTC instructors from a population of approximately 3,400 whose learning styles then were compared with those of a comparable random sample of high school instructors from the general population. These adults represented JROTC Programs distributed throughout the United States. Instructors ranged in age from 45 to 70 and included 147 Caucasian Americans, 57 African Americans, and 29 instructors of "other" ethnic backgrounds.

Instrumentation

Two instruments served as the basic vehicle for this investigation's data collection. The first was used to identify the cadets' learning-style strengths and the second was used to identify their instructors' learning-style strengths (see Appendix A).

1. The Learning-Styles Inventory. Curry's (1987) psychometric analyses of 21 different learning-style identification assessments found that the Dunn, Dunn, and Price (1997) Learning-Styles Inventory (LSI) had one of the highest reliability and validity ratings. Its predictive validity was demonstrated repeatedly through extensive experimental research during the previous three decades (Research on the Dunn and Dunn Model, 2001). As early as 1982, Keefe had indicated that the LSI was the most widely used learning-style assessment in elementary and secondary schools.

Students who participated in this study were diagnosed for their learning-style preferences with the LSI, which is available in several languages and different versions for students in grades 3-4, 5-12, and for adults (see Appendix A). **This instrument identifies the conditions under which each student is most likely to concentrate on, learn, internalize, and remember new and difficult academic information.**

The LSI does not measure underlying psychological factors, value systems, or the quality of attitudes. Rather, it yields information about the patterns through which individual learning occurs by analyzing the environmental, emotional, sociological, physiological, and global versus analytic processing preferences each student prefers when learning new and difficult academic material. It uses 104 dichotomous items and can be completed in approximately 30 to 40 minutes either orally or in writing. It provides a consistency key to reveal the accuracy with which each respondent answers its questions. The National Center for Research in Vocational Education at the Ohio State

University published the results of its two-year study of instruments that diagnose learning styles and reported that the LSI has "established impressive reliability and face and construct validity" (Kirby, 1979, p.72). The LSI evidenced predictive validity in experimental studies conducted by Callan (1999); Dunn, Bruno, et al., (1990); Dunn, Della Valle, et al. (1986); Dunn, Dunn, Primavera, Sinatra, and Virostko (1987); Dunn, Giannitti, et al. (1990); Dunn, Krimsky, Murray, and Quinn (1985); Dunn, White, and Zenhausern (1982); Gremli (1999); Lenehan, Dunn, Ingham, Murray, and Signer (1994); Martini (1986); Mickler and Zippert (1987); Mitchell (2000); and Pizzo, Dunn, and Dunn (1990). Hoyt's Reliabilities for the LSI range between .56 and .88 (Price & Dunn, 1997).

2. The Productivity Environmental Preference Survey. The Productivity Environmental Preference Survey (PEPS) (Dunn, Dunn, & Price, 1979, 1980, 1990, 1996) is a measurement of the learning styles of adults. Data elicited through PEPS have been instrumental in helping adult learners improve their achievement in both academic and workplace settings (Buell & Buell, 1987; Clark-Thayer, 1987; Cook, 1989; Dunn, Bruno, Sklar, & Beaudry, 1990; Dunn, Deckinger, Withers, & Katzenstein, 1990; Hamlin, 2002; Ingham, 1991; Lenehan et al., 1994; Nelson et al., 1993; Raupers, 2000-2001; Taylor, 1999). The instrument consists of 100 dichotomous questions that elicit self-diagnostic responses related to five domains of 21 discrete learning-style elements on a 5-point Likert Scale (Dunn, Dunn, & Price, 1996). Participants rate how they would most like to learn new and difficult academic information and skills in varying circumstances.

According to the PEPS 1991 Manual, items were developed in accord with "research variables that appeared to describe the ways individuals prefer to learn or work" (Price, Dunn, & Dunn, 1991, p. 18). A factor analysis of the instrument revealed that 31 factors with eigenvalues from 7.89 to 1.02 accounted for 65% of the total variance. As a result, the factors were collapsed into 21 discrete elements.

Reliability and validity were established with a population of 589 adults in varied settings from geographically diverse states. It was reported that 75% of the reliability coefficients were equal to or greater than .70 (Price, Dunn, & Dunn, 1996). LaMothe et al. (1991) at Indiana University provided strong reliability and validity data for the PEPS with nursing students. Later, when using the PEPS in experimental studies with various groups of adults, Dunn, Bruno, et al. (1990), Hamlin (2001), Lenehan et al. (1994), and Nelson et al. (1993) corroborated the predictive validity of the PEPS analyses.

SECTION II.

Summary of Findings Related to JROTC Students' Learning-Style Preferences as Compared with Those of the General Population

JROTC cadets differed from other high school students randomly selected from a national database on five learning-style characteristics. These included the cadets':

1. preferences for an informal learning environment when concentrating;
2. strong time-of-day energy levels;
3. tactual perceptual preferences;
4. strong self-motivation; and
5. preferences for a variety of instructional approaches rather than routine and patterned learning.

Each of these learning-style characteristics is discussed in greater detail below.

Informal seating. Traditional schooling includes a wooden, steel, or plastic chair and desk for each learner over an extended period of hours

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daily—which physically challenges most males and many females. When human beings are seated on *formal* (hard) furniture, fully three-quarters of their total body weight is resting on four square inches of *bone* (Branton, 1966). Only people who happen to be *well padded exactly where they have to be*, can sit, and remain concentrating on challenging academic subject matter for more than 12-15 minutes. Others find their attention wandering after that amount of time because of their physical discomfort. Some actually describe pain radiating up and down their backs, legs, or thighs.

On average, JROTC students preferred a more informal learning environment than the general student population. Whatever the reason, many disliked the traditionally formal classroom seating arrangements of straight rows of desks. To respond to this preference, instructors should add a few easy chairs, couches, pillows, beanbags, or small rugs to their classrooms to create at least one or two informal and relaxed instructional sections or spaces.

An alternative would be to allow cadets who need informal seating to maintain concentration to bring pillows to place on their chairs during class. Padding otherwise-formal furniture assists students' concentration and, if the objective is to increase the likelihood of graduation, everything contributes to academic success—particularly physical comfort. Parents and local citizens may care to donate items that could make the classroom more accommodating to students who require a more flexible environment.

Late morning. The general population strongly preferred learning in the late morning significantly more than the JROTC students did. Conversely, the JROTC students' energy curve, as a group, was not high at 10:00 a.m. Time-of-day energy is an individual trait that cannot be deduced based on group norms. Nevertheless, JROTC students' programs should avoid scheduling their most challenging academic classes between 10:00 and 12:00 in the morning. Examination of cadets' individual learning-style profiles will reveal many early-morning, afternoon, and evening preferents.

If cadets' class schedules are fixed and administrators will not experiment with altering even a percentage of them to determine the effects of non-mid-morning scheduling on grades, then **instructors should be advised to employ instructional strategies that actively engage the learners**. These could include teaching with Learning Styles strategies, such as, *(See Figure 3, p.19)* CAPs, PLS, MIPs, tactual and kinesthetic resources, small-group techniques such as Team Learning, Circle of Knowledge, simulations, role playing, songs, poetry, skits, or drama (Dunn & Dunn, 1993, 1999).

Low tactual perceptual preferences. Compared to the general population, JROTC students revealed significantly less of a preference for learning tactually than did the general population of high school students. Therefore, hands-on instruction instructional resources are unlikely to prove as effective with these students as they might be with the general high school population. Again, cadets' individual learning-styles should be examined and, rather than basing their instructional prescriptions on the *group's* overall profile, they should be designated based on each cadet's unique Learning Style Inventory (LSI) (Dunn, Dunn, & Price, 1997) profile. Nevertheless, Learning Styles strategies such as, CAPs, PLS, MIPs, *(See Figure 2, p.19)* and other student-engaging activities should be considered –particularly for use during late morning classes.

Cadets should be made aware of their personal individual perceptual strengths—auditory, visual, tactual, or kinesthetic—and should be shown how to use each strength to master new and difficult academic material (Dunn, in press). Initial learning should occur through each person's *strongest* perception and reinforcement should focus on the individual's second- and/or third- strongest perceptual preferences. For example, a cadet with a kinesthetic strength should use Floor Games or work-related activities through which to master new academic skills or information as the first exposure. The cadet then could use visual, tactual, or auditory resources—in

the order of his or her preference—to ensure retention of the material. **This knowledge will be invaluable to the instructors as they present information, skills and knowledge in more active and engaging ways, than traditional lecture dependent modes.**

High self-motivation. As a group, JROTC **cadets were more self-motivated than comparable, randomly selected students in the general high school population.** This indicated that instructors working with these students should encourage the use of self-developed learning objectives, self-pacing, and self-designed instructional materials and creative individual and/or paired activities. **Routine instructor-directed instruction, lectures, readings, and close supervision by their instructors are likely to cause resentment and/or reduced independence, maturity, and appreciation of schooling for these students.** In contrast, availability of specific Learning Styles strategies, such as, Contract Activity Packages and Programemed Learning Sequences*(See Figure 3, p.19)*. accompanied by positive feedback and encouraging guidance, are likely to increase their motivation and performance. **Traditional classroom teaching, particularly in light of the cadets' preference for variety, is likely to be significantly less productive for these young adults than the alternative instructional approaches recommended in this section.**

Learning in several ways. Students participating in JROTC programs tended to need a variety of learning experiences, such as (a) learning independently, with their peers, in small groups, and under the guidance of instructors, parents, or other adults; (b) Strategic Learning Tools, e.g., CAPs, PLS, MIPs, Independent Studies, and/or some self-directed learning experience*(See Figure3, p.19)*.Varied approaches can be enhanced by multimedia and/or computer-based instructional technologies. **As indicated in the previous section, traditional lecture as a basic pattern—or any other instructional routine, is unlikely to be as beneficial for these youngsters' achievement as would a variety of learning experiences.**

Gender Differences in JROTC Students' Learning-Style Preferences

On average, male and female students participating in JROTC programs differed from each other on 11 of the learning-style variables—self-motivation, temperature, tactual and kinesthetic modality preferences, need for intake, learning in a variety of ways, learning alone versus with peers, design or instructional environment, sound, structure, and responsibility. Each of these learning-style characteristics—grouped according to gender preferences—is discussed in greater detail below:

Female learning-style characteristics. Overall, the JROTC group reported higher levels of self-motivation than the general population. Within the JROTC group, females tended to be even more self-motivated than their male counterparts—which tends to be accurate in every mixed-gender group in every nation studied, as well as international studies including Bermuda, Brunei, Brazil, Canada, Egypt, Germany, Guatemala, Hungary, Korea, New Zealand, the Philippines, Sweden, and the United States (De Paula, in progress; Hlawaty, in progress; Honigsfeld, 2001; Milgram, Dunn, & Price, 1993; Pengiran-Jadid, 1998).

Females also preferred a warmer environment and needed more intake(food or liquid) than males— while learning new and difficult information. Encourage women students to wear layers and have healthy snacks available during the day in school. The JROTC female cadets also preferred to learn in a variety of sociological ways—alone, with peers, in a group, and with an authoritative or collegial instructor at different times, rather than in the same pattern as a routine.

Female students wanted more structure than their male counterparts, indicating the importance of providing clear instructional objectives for everyone, but particularly for those who need to know (a) exactly what they are responsible for learning and (b) when and (c) how they will be required to demonstrate that

knowledge. For those in need of structure, instructors should:

• provide clearly stated objectives;

• identify appropriate procedures and alternatives for mastering those objectives;

• indicate each assignment to be accomplished; and

• specify the available resources to be used and time requirements.

Male learning-style characteristics. **Male students were more peer-motivated than their female counterparts** - another across-the-board trait revealed among adolescents studied in many nations (De Paula, in progress; Hlawaty, in progress; Honigsfeld, 2001; Milgram et al., 1993; Pengiran-Jadid, 1998). **This finding implies males' need for instructional approaches that allow and encourage student interaction, rather than independent task completion—a traditional practice exercised widely**. Small group instructional techniques such as brainstorming, Team Learning, Circle of Knowledge, case studies, and simulations should be effective with the many JROTC male students who prefer learning with one or more classmates. However, instructors should not require all JROTC males to learn with a classmate or two. The learning-alone and learning-with-instructor preferents should be permitted to complete assignments and projects in their preferred style—despite the fact that a large group (but *not* the majority) of JROTC males stay on task better with others than they do independently. Thus, for any academic assignment to be completed in class, many males may learn in small groups of two-four, but a few will choose to work alone and some will question their instructor repeatedly. Simultaneously, more females will work alone, some will seek their instructor, and a few will elect to work in teams, whereas more will study with one classmate.

JROTC males had stronger preferences for tactual and kinesthetic learning experiences than did the JROTC females, but you will recall that, as a group, JROTC cadets preferred less tactual and kinesthetic learning than the general population with whom their preferences were compared. These data demonstrate the danger of generalizations. Knowing that JROTC (a) cadets as a group and (b) females in contrast with males, prefer learning with fewer manipulatives and hands-on experiences than the randomly selected high school students in the general population and the males in the JROTC sample, instructors might tend to avoid tactual and kinesthetic instructional resources, such as Learning Styles tools, e.g., Electroboards, Flip Chutes, Pic-A-Holes, Task Cards, and Floor Games.*(See Figure 3, p.19)* Nevertheless, there undoubtedly will be some students in every class that only will be able to learn complex content with these practical, easy-to-make-and-use devices.

Thus, for some students, the traditional audio-visual lecture and chalkboard approach will be effective; whereas for others, small-group, peer-involved strategies will prove much better. At the same time, some males (and a couple of females) will need to learn with tactual and kinesthetic resources while others work independently with books, CAPS, PLSs, multimedia, or computer programs. **This is not necessarily a complicated scenario. Instructors need only assign the objectives, point out alternative ways of completing them, establish time lines and expectations for completion, and encourage cadets to choose the strategy that best complements their individual learning style**.

On average, males students participating in JROTC programs were less responsible or conforming than their female counterparts, corroborating findings of many other studies conducted in the United States and overseas (Research on the Dunn and Dunn Model, 2001). Strategies recommended by Dunn and Dunn (1992, 1993) for use with non-conforming students include the following. The instructor should:

1. clearly explain why, what the students are required to master, is important to the *instructor (*not to the student);

2. provide choices for how students may demonstrate that they have completed their tasks; and

3. speak as an "equal,"

rather than authoritatively.

Ethnicity Differences of JROTC Students' Learning-Style Preferences

For the purposes of this report, students' ethnicity was identified as either (a)African American, (b)Asian American, (c)Caucasian American, (d) Hispanic American, (e) Native American, or (f) Other. Due to the unknown composition of the latter category, we examined only the learning-style preferences of the five known groups. On average, students of African American, Asian American,Caucasian American, Hispanic American and Native American backgrounds who participated in JROTC programs differed from each other on nine learning-style variables:

1. levels of self- and instructor-motivation;
2. tactual and visual modality preferences;
3. temperature preferences;
4. time-of-day energy levels;
5. need for sound versus quiet;
6. design or environmental needs; and
7. levels of responsibility which means (conformity versus non-conformity).

Each of these learning-style characteristics is discussed in depth below. Since our purpose was to provide practical guidance for the delivery of classroom instruction, we therefore focused on the findings' practical significance in terms of the differences among the ethnic groups rather than on detailed comparisons of all the statistically significant pairwise comparisons.

Self-motivation. Of the five identified ethnic groups, the JROTC African American and Hispanic American students were the *most* academically self-motivated, whereas the Native American and Caucasian American students were the least self-motivated. **Highly motivated students should participate in designing their own instructional objectives**. If flexibility for self-designing units of study is not feasible, then self-motivated cadets certainly should be permitted to choose their own resources and procedures to meet required objectives and assessments.

Teacher motivation. African Americans were the most teacher or instructor motivated and Native and Asian Americans were the least instructor-motivated in the JROTC group. **Highly instructor-motivated students need to receive frequent feedback and encouragement from their instructors. Instructor-student interactions are vital to the academic success of these students**. For less instructor-motivated students, instructors should encourage peer learning through the use of structured small-group strategies such as Team Learning to *introduce* new and difficult academic content *and* Circle of Knowledge to *reinforce* it (Dunn & Dunn, 1993, 1999). Providing *opportunities* for decision making also gradually may develop individuals' reliance on themselves (or peers) rather than on their instructors' expectations. Nevertheless, instructor-motivated students continue to require frequent interaction with adults whom they admire and respect. **Rather, instructors need to understand that these students may be their strongest admirers and are likely to emulate them as role models**.

Perceptual modality strengths. Native Americans, followed by Caucasian Americans, revealed the *strongest tactual* and the *weakest visual* perceptual preferences. On the other hand, African Americans *least preferred to learn tactually*; most preferred to learn visually. **Adapting the modality of instruction—auditory, visual, tactual, and kinesthetic—based on the most effective way to reach students, is one of the most effective ways of responding to individual learning styles**. New and difficult information should be *introduced* through the students' primary modality and then *reinforced* through their secondary and tertiary perceptual strengths (Dunn & Dunn, 1993).

1. For tactually-preferenced students, use manipulatives, three-dimensional materials, and real objects. In addition to manipulating these objects, students should be encouraged to keep written or graphic records of what they are learning.

2. For students with a visual perceptual strength, use colorful

visual aids, transparencies, pictures, films, videotapes, graphic organizers, and technology such as computer programs, Internet, and PowerPoint.

Instructors should allow visually-preferenced students to read the material *in advance* of class discussions.

Temperature Preferences. African Americans and Caucasian Americans required the warmest environment and Hispanic American students required the coolest environment. **Allowing students to self-select their seats in the classroom—either close to, or away from, sources of heat or ventilation depending on their preferences, as well as encouraging them to dress in layers may respond to this environmental factor.** Thirty percent of body heat loss is through the head; thus, wearing uniform hats may be helpful.

Design Preferences. The conventional classroom setting with wooden, plastic, or metal chairs and desks appealed to more Hispanic American students than to others. However, even then, it was not the preference of the majority of any group—Asian, African, or Hispanic American, and was the *least preferred* by Native Americans.

A previous section on design explains how to respond to variations in design preferences. **However, even if it is not feasible in the school setting, make students aware of their environmental preferences and encourage appropriate choices when they study at home.**

Sound Preferences. Caucasian American and Native American students indicated the most need for sound while learning; whereas, African American students least preferred background sound while concentrating on new and difficult information. **To respond to this difference in environmental needs in the classroom, establish separate areas for students who prefer silence and wish to work on an assignment quietly and for students who learn better in an activity-oriented environment in which interaction is conducive to learning.** In addition, suggest that students who function better with sound do their homework with non-distracting background music that contains no words, (i.e., Mozart's piano or violin sonatas and concertos). Acknowledging differences among the environmental preferences of ethnic groups is an important contribution. However, it is crucial to stress that there are more differences *within* each group than there are *between* groups. Therefore, instructional decisions should never be made on the basis of group norms. Instead, they always should be determined through identification of individual data based on a reliable and valid test.

Time-of-day energy levels. As a group, more Hispanic Americans and African American JROTC students preferred to learn new and difficult information early in the day, whereas Native Americans and Caucasian Americans functioned better later in the day. Students should take advantage of any strong energy spurt they may have. Offering academically challenging courses in various parts of the day would allow students to select the schedule most congruent with their best time of day—which should improve their academic achievement Callan (1995, 1996, 1998, 1999). **In addition, permitting students to take tests at their best time of day will improve their test outcomes (Lemmon, 1985).**

Responsibility. In this sample of JROTC cadets, African Americans were the most, and the Native Americans were the least, responsible or conforming of the five groups. However, in a previous analysis of the learning styles of poorly achieving African American males, it was reported that they were the *highly non-conforming* students. Apparently, the African American males who elected to participate in JROTC, represented the most motivated, most responsible, and most likely-to-achieve students in their group at those sites.

Instructors can respond to students' varied levels of responsibility by assigning tasks that gradually increase in length, scope, and complexity. **Nonconforming or less responsible students need well-designed, short-term assignments with a limited number of objectives.** As tasks are successfully completed, more options may be given. **Pairing up more and less responsible students who**

are required to accomplish the same task may be one effective way of developing positive student interdependence leading toward increased responsibility, and should be explored.

SECTION III

Summary of Findings Related to JROTC Instructors' Learning-Style Preferences as Compared with Those of the General Population

Two hundred and thirty-three (233) JROTC instructors' learning-styles were compared with those of a comparable random sample from the general population. **Eight learning-style characteristics differentiated between the two groups: need for mobility, structure, late morning and afternoon, temperature, sound, design, and intake of food and liquid preferences.**

Since the 1964 JROTC Vitalization Act, military retirees at high schools nationwide have taught the program. It is in light of this background that the JROTC instructors' learning styles are discussed below.

Need for mobility. Compared with the general population of high school teachers, JROTC instructors required substantially less mobility than their counterparts throughout the nation. They preferred to accomplish tasks without unnecessary movement and did not require frequent breaks. Neither did they prefer much active engagement. These findings either may be the result of the ages of these instructors or may reveal their lack of non-traditional, alternative, varied, or learning-style specific teacher education.

Nevertheless, their preference for only limited mobility indicates limited variety and spontaneity—which is inconsistent with the learning style of alternative, non-traditional, or learning-style specific Teacher Education training. **Moreover, the JROTC instructors' preference for non-active teaching is at variance with the national trend for newly mandated teaching practices, such as those exemplified by The National Science Education Standards (NSES) outlined by the National Research Council (1996).** Those Standards were designed to enable all students to achieve science literacy in the 21st century and called for a *complete overhaul of the educational system* and for science to become a *student-engaging, active process driven by neither textbook nor content.* According to the NSES, science learning must occur through an *active* process.

Structure. The general population required more structure than the JROTC instructors—which was surprising in light of the latter's military background and generally perceived need for high structure. Perhaps having retired from the service, these instructors preferred options and choices for themselves during their JROTC assignment. Interestingly, during this period of their lives, the JROTC instructors preferred optional resources, procedures, time lines, and alternatives for themselves. Therefore, it might not be difficult to convince that their young students need similar choices.

Time-of-day preferences. The JROTC instructors preferred afternoon, rather than late-morning hours more than the general population did. It is possible that after a strict military regimen over many years, in addition to the aging process for teaching as a second career for these persons (Van Wynen, 1999), the instructors preferred a departure from their early-rising schedule of military life and now preferred morning relaxation followed by afternoon involvement. However, preferring to teach in the afternoon complements the schedules of many high school programs.

Environmental preferences. These JROTC instructors preferred a warmer and more formal instructional environment, and more sound than the general population. One of the possible reasons for this finding could be that, as people age, they prefer both more warmth and more formal seating than previously (Van Wynen, 1999). **Nevertheless, it would not be difficult for the JROTC instructors to sit at either their or their students' desks while the cadets pursue an actively engaging curriculum through *their* individual learning**

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styles.

Intake. Overall, the general population required more food and liquid intake than did the JROTC instructors. This, however, is a group finding and many individuals among the JROTC instructors preferred concentrating on academic tasks *while* snacking. In addition, current nutritional emphasis on health-related reasons for eating well and maintaining appropriate weight, as well as the instructors' ages (Van Wynen, 1999), may have contributed to their lesser need for eating or drinking while concentrating on academic tasks.

JROTC instructors' learning-style preferences do impact on how they personally process and internalize new information during professional development courses, in-service sessions, or when involved in their own learning process. Without a thorough knowledge of learning styles, the instructors' individual learning styles also may impact on what they perceive to be effective teaching approaches for their students. Most teachers and parents assume that there is one best way to learn (Dunn & Dunn, 1992, 1993), and that "best way" is their way. **Indeed, research has indicated that a one-size-fits-all instructional approach to teaching and learning has been ineffective for most students and actually harmful to many** (Dunn & DeBello, 1999; Tomlinson, 1999; Van Wynen, 1997). Thus, we strongly recommend that all JROTC instructors be made aware of the variations of learning styles that exist among their students and between their students and themselves, and that the instructors be shown how to respond to that diversity.

Gender Differences in JROTC Instructors' Learning-Style Preferences

There were two significant differences between the learning-style preferences of the male and female JROTC instructors who participated in this survey. Overall, male instructors were more self-motivated than their female counterparts—*a noticeable departure from the data elicited from previous investigations concerning gender differences* (Dunn & Griggs, 1995; Honigsfeld, 2001; Milgram, Dunn, & Price, 1993; Van Wynen, 1999) and a characteristic that may be specific to this population. Female instructors, on the other hand, were more auditory than males, which confirmed previous findings that, regardless of group or ethnicity, females tended to be significantly more auditory than males (Dunn, 1996; Milgram, Dunn, & Price, 1993; Pizzo et al., 1990). **In response to these gender differences, in-service training and professional development programs designed for JROTC instructors should consider male participants' relatively higher levels of self-motivation**. It would be wise to provide these males with opportunities in which to self-design their professional development goals and the procedures used to reach them. *Some* female instructors also may respond well to staff development programs based on their own personal objectives. However, more of this particular group of female instructors would be likely to respond best to program objectives in harmony with their preference for learning as designated by an authoritative source such as the official Manual or a supervisor.

Ethnicity Differences in JROTC Instructors' Learning-Style Preferences

Due to the limited number of participants from various other ethnic backgrounds, only the learning-style preferences of Caucasian American and African American JROTC instructors were compared. Two learning-style elements differentiated between these two ethnic groups—temperature and time-of-day preferences.

On average, Caucasian American instructors preferred learning more during the late-morning hours than did African American instructors. Overall, the latter preferred a warmer instructional environment than Caucasian Americans. These preferences easily can, and should, be accommodated when planning future professional development sessions for these instructors (Dunn & Dunn, 1999). **The steps to take would be to develop participants' awareness of their own and their students' learning-style preferences, provide a knowledge base for how to work**

with those trait differences harmoniously, and either permit options of assignments or teach students to teach themselves and each other.

SECTION IV.

Instructional Implications of the Similarities and Differences Between JROTC Cadets' and their Instructors' Learning-Styles Preferences

Similarities

Compared to the general population, JROTC instructors expressed a lesser need for externally imposed structure. JROTC instructors apparently feel comfortable and productive when they are permitted instructional choices of such things as resources, procedures, time lines, and methods. Similarly, these data corroborated that; overall, the highly motivated JROTC cadets whom they teach also are likely to function well with self-selected and self-structured tasks. In light of these similarities between the JROTC instructors' and cadets' styles, the former need only provide structure, feedback, and guidance to motivated cadets on an "as needed" basis rather than as a routine. **In contrast to imposing too much structure on, and control over, the cadets as they prove to be successful with options, instructors should experiment with gradually adding many self-selected options to the cadets' instructional experiences.** It would be most wise to introduce self-directed and independence-generating approaches *(See Figure 3, Below)* (Boyle & Dolle, in press; Lefkowitz, 2001; Miller & Dunn, 1997; Miller et al., 2000-2001).

Differences

JROTC instructors expressed a significantly lesser need for mobility than the general population. They preferred to accomplish tasks in a stationary mode without frequent breaks or much movement. **JROTC cadets, on the other hand, affirmed that they enjoyed learning actively and with a variety of approaches to permit diverse sociological interactions such as learning independently, in pairs, with peers, as part of a team, or with the teacher.** Employing alternative grouping strategies, such as brainstorming, case studies, Circle of Knowledge, simulations, and/or Team Learning (Dunn & Dunn, 1993, 1999), incorporating technology, and introducing engaging non-traditional instructional strategies such *(See Figure 3, Below)* (Dunn & Dunn, 1993, 1999) would be crucial to the academic success of the JROTC cadets who *clearly indicated a need for active involvement, mobility, variety, choices, and instructional approaches that permit self-directed activities.*

Figure 3. Alternative methods for learning challenging materials, and how they respond to learning-elements and other student characteristics

Alternative Methods	Responding to Learning-Style:	
	Elements/Preferences	**Other Student Traits**
CONTRACT ACTIVITY PACKAGES	Environmental Preferences Sociological Preferences Auditory/Visual Strength Physiological Preferences Persistence Motivation Structure Analytic Processing	Self-pacing Independence Non-conformity Creativity

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PROGRAMMED LEARNING SEQUENCES	Persistence Sociological Preferences Environmental Preferences Structure Physiological Preferences Visual/Tactual Strengths Global Processing Style Analytic Processing	Self-Pacing Variety Reading Difficulties Needing Feedback
TACTUAL RESOURCES	Tactual Perceptual Strength Environmental Preferences Physiological Preferences Sociological Preferences Analytic Processing Style Global Processing Style	
KINESTHETIC RESOURCES	Kinesthetic Perceptual Strength Environmental Preferences Physiological Preferences Sociological Preferences Analytic Processing Style Global Processing Style	

Figure Created by Professor Rita Dunn

Conversely, introducing these approaches may be challenging for JROTC instructors who personally prefer to learn without mobility or frequent breaks. Inevitably, activity-oriented strategies require students to move about and form different groups or work in different sections of the room. **However, we strongly advise that JORTC instructors expand their teaching repertoire to more effectively respond to their students' needs for self-directed instructional variety and mobility**. Unless these instructional changes are made, JROTC cadets cannot be expected to perform better than they have in the past—which is not as well as they are capable of performing.

JROTC instructors preferred late morning academic concentration more than the general population and more than many of the cadets who indicated a lesser preference for that same time period. The conflicting energy curves of these instructors and cadets reflect the normal age differences between young and older adults (Dunn & Griggs, 1995), but are likely to lead to incompatible energy problems for many members of both groups. Instructional periods should be as responsive as possible to the chronobiological levels of both cadets and their instructors. The use of CAPs, PLSs, and small-group strategies during the cadets' energy highs conceivably could remedy this problem (See Figure 3, Above). It would permit the students to experience the variety and relative decision-making for which they expressed a desire and, simultaneously, allow the instructors to facilitate and observe the process, rather than be actively engaged during their energy lows.

Compared with the general population, JROTC instructors preferred a more formal instructional environment; whereas, JROTC cadets preferred a more informal instructional environment. It may be difficult for JROTC

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instructors to create a relaxed classroom when they, personally, have strong preferences for a formal environment. Nevertheless, if instructors are interested in elevating their students' academic achievement, we recommend that they create—or encourage their students to create—informal and relaxed learning spaces in a designated section of their classrooms to accommodate students who function best in a non-traditional environment.

SECTION V.

Conclusions

It is fortunate that the Army Cadet Command has now conducted this study to determine new, innovative strategies to achieve its mission across the country and abroad where JROTC programs are conducted. This direction will not only enhance individual instructor and student achievement, but will reduce drop out rates and enhance overall program success.

This research identified the learning-style preferences of a representative sample of JROTC Cadets. It then compared the cadets' preferences with those of the general population of high school students in the United States and examined possible relationships by gender and ethnicity. It also identified the learning-style traits that characterized the instructors who taught the JROTC cadets. It then compared their styles with those of the general population of faculty in a random population of high schools across the nation, and revealed gender and ethnic differences in style within the group of participating JROTC instructors.

If federal funds annually allocated to JROTC activities are to be maximized, and if cadets literally are to achieve at their maximum potential because of this program, then identifying, respecting, and accommodating diverse learning-style strengths is vital to those goals. It has been documented that gifted, at-risk, disadvantaged, ethnically diverse, and general education adolescents each have many distinct learning-style characteristics (Research on the Dunn and Dunn Model, 2001). Because no previous research has been conducted to identify the learning styles of JROTC cadets and the instructors who teach them, this investigation was designed to both fill that void and expand our nation's understanding of this unique population.

As described in this manuscript, (a) specific learning-style characteristics were unique to both JROTC instructors and cadets and (b) there were many similarities within and between groups of students and instructors as well. **To capitalize on these findings, this report should serve as the basis for expanding current instructors' knowledge of their JROTC cadets' learning styles and how to base their instructional environments and methods to become more beneficial for meeting the short- and long-range leadership and citizenship goals of the organization as a whole.**

This study and it's recommendations correspond to and reinforce policy and program directions currently being implemented by Cadet Command. Consequently, it is advised that JROTC instructors be provided training in how to teach students through their learning-style strengths (Dunn & Dunn, 1999). After instructors have experienced that instructional development and been provided a period of supervised, in-class implementation to enhance their newly-developed skills, a few demonstration projects should be designed to determine whether the existing positive effects that resulted for students in the general and Special Education populations throughout the United States also are achieved for JROTC programs. (Alberg et al., 1992; Dunn & DeBello, 1999).

Table 1. Note. DAI stands for Dissertation Abstracts International.

Descriptive/Correlational Research Concerning Adolescents' Learning Styles

Researcher	Journal or Source	Year	Types of Adolescents Described
Avise	DAI	1982	Senior and Junior High School
Bottroff	DAI	1993	Tenth Grade [Religion]
Brodhead & Price	Teaching and Counseling Gifted and Talented ...	1993	Canadian [Artistically Talented]
Cager	DAI	1994	Gifted and Non-gifted African American
Carson	DAI	1996	Beta Club and National Honor Society vs. Alternative School
Cody	DAI	1983	Average, Gifted, and Highly Gifted, Grades 9-12
Cooper	DAI	1991	Two Alternative High Schools'
Crampton	DAI	1990	Private, Residential, Alternative High School
Currence	DAI	1991	Rural Persister vs. Dropout
Dunn	Inter Ed	1993	Gifted in Nine Nations
Dunn et al.	The American Biology Instructor	1982	General High School
Dunn & Griggs	Multiculturalism and Learning Style ...	1995	African vs. Asian vs. European vs. Hispanic vs. Native American
Ewing & Yong	Roeper Review	1992	Middle School Gifted Minority
Foster	DAI	1994	Arizona and New Mexico Navajo vs. White, Grade 11
Gadwa & Griggs	The School Counselor	1985	Dropout vs. Alternative Ed
Greb	DAI	1999	Medically Diagnosed, AD/HD, Grades 9-12
Griggs & Dunn	The Principal	1988	Secondary School Dropout, Alternative, & Traditional
Griggs & Dunn	Emergency Librarian	1996	Asian-American
Griggs & Price	Roeper Review	1980	Suburban Junior High School Gifted vs. Average
Griggs & Price	Creative Child and Adult Quarterly	1982	Suburban Junior High School, Gifted vs. Average
Honigsfeld	Gifted and Talented International	2000	Hungarian Highly Achieving and Creative
Ignelzi-Ferraro	DAI	1989	Mildly Handicapped
Johnson	DAI	1984	Dropout vs. Non-dropout
Johnston	DAI	1986	High School Industrial Arts
Jorge	DAI	1990	Junior High School
Mein	DAI	1984	High School Gifted

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Melone	DAI	1987	Junior High School
Montgomery	DAI	1993	Traditional High School [vs. Vocational School Adults]
Nadal-Vazquez	DAI	1991	High School [Spanish-Speaking]
Nations-Miller	DAI	1993	Urban High School At-risk, Gifted, and Vocational
Paskewitz	DAI	1985	Junior High School Gifted
Pengiran-Jadid	DAI	1998	Bruneian Performing and Non-performing Elite and Regular Secondary School [and Their Instructors' Teaching Styles]
Phelix	DAI	1987	Black and Hispanic Male [Compatible vs. Incompatible Counseling]
Ponder	DAI	1990	General High School
Price	Learning Styles Newsletter	1980	General High School
Raviotta	DAI	1988	High School [Mathematics]
Roberts	DAI	1984	Bahamian and Jamaican Senior High School
Sawyer	NASSP Bulletin	1995	General High School
Sinatra, Hirshoren, & Primavera	Educational and Psychological Research	1987	High School Adjudicated
Sinatra, Sazo de Mendez, & Price	Teaching and Counseling Gifted and Talented Adolescents	1993	Guatemalan
Snider	DAI	1985	Educable Mentally Impaired, Emotionally Impaired, Learning Disabled, and General Education 7th, 8th, and 9th Grade
Solomon	IMPACT	2000	Spanish
Spiridakis	Teaching and Counseling Gifted and Talented Adolescents	1993	Greek
Tappenden	DAI	1983	Rural, Urban, and Suburban 11th- and 12th- Grade, Vocational and Non-vocational Education
Vigna	DAI	1983	High School Gifted/ Non-gifted
Yeap	DAI	1984	Secondary Singapore
Yong	DAI	1991	Junior High School Gifted, Minority
Yong & McIntyre	Journal of Learning Disabilities	1992	High School Learning Disabled/ Gifted
Wechsler	Teaching and Counseling Gifted and Talented Adolescents	1993	Creative Brazilian
Wiley	DAI	1996	Seriously Emotionally Disturbed Psychiatric

Williams	DAI	1989	LD and Non-LD
Wittenberg	DAI	1984	Remedial Young Adult
Zak	DAI	1989	Vocational and Non-vocational

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Table 2. Note. DAI stands for Dissertation Abstracts International.

Experimental Research Concerning the Effects of Teaching Adolescents Through Their Learning Styles

Researcher	Journal or Source	Year	Types of Adolescents Described
Brand, E.	DAI	1999	High School Low Achievers
Brennan	DAI	1984	High School [General Math]
Brunner & Hill	Physical Education, Recreation and Dance	1992	High School Athletes
Brunner & Majewski	Educational Leadership	1990	High School Mildly Handicapped
Burke & Dunn	Improved Test Scores, Attitudes, and Behaviors in America's Schools ...	1999	General High School [English]
Callan	NASSP Bulletin	1996	Catholic High School
Callan	Journal of Educational Research	1999	Catholic High School
Clarke	DAI	1993	Below-Average Sophomore
Kroon	DAI	1985	High School [Industrial Arts]
Lengel	DAI	1983	Former Psychiatric Patients
Lovelace & Dunn	Improved Test Scores, Attitudes, and Behaviors in America's Schools ...	1999	High School [Science]
Lynch	DAI	1981	11th and 12th Grade, Initial/ Chronic Truant
Marino	Momentum	1993	High School [Homework]
Merckling	DAI	1999	High School [Graphing Calculators]
Mitchell	Impact	2000	High School LD [English]
Mitchell & D'Anna	Impact	1998	High School Learning Disabled [Literature]
Moore	DAI	1991	8th Grade [Language Arts/ Mathematics]
O'Connell	NYSASCD Impact	2000	High School [Science]
Ryan & Dunn	Improved Test Scores, Attitudes, and Behaviors in America's Schools ...	1999	Rural High School
Shea	DAI	1983	Suburban High School
Sinatra	Journal of Reading, Writing, and Learning Disabilities International	1990	Suburban High School
Studd	The Clearing House	1995	Suburban High School
Sulner	DAI	2001	Multiple and Profoundly Disabled
Thrasher	Florida Association of		

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	Alternative School Educators	1984	At-risk 6th and 9th Grade
Tanenbaum	DAI	1982	High School [Nutrition]
Young	Pacific-Asian Education	1993	7th Grade

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Appendix A

Instruments for Identifying Learning Style

The following instruments have been proven reliable and valid. **Use the grade-appropriate version!**

Our Wonderful Learning Styles (OWLS) (Guastello & Dunn) (Grades 1, 2-4)

Learning Style Inventory (**LSI**) (Dunn, Dunn, & Price) (Grades 5-12); available in multiple languages

Learning Style Inventory (**LSI**) (Dunn, Dunn, & Price) (Grades 3-4)

Productivity Environmental Preference Scale (**PEPS**) (Dunn, Dunn, & Price) (Post-High School Adult Students)

Building Excellence (BE) (Rundle & Dunn (Business and Corporate Personnel Training)

FOR FURTHER INFORMATION:

For information on this report or the acquisition of information about Learning Styles instruments, training and support, feel free to contact Dr. Laurence D. Martel at (nail@hargray.com) or mail your inquiry to Dr Martel at P.O. Drawer 5784; Hilton Head Island; South Carolina 29938; Phone: 843-686-4050.

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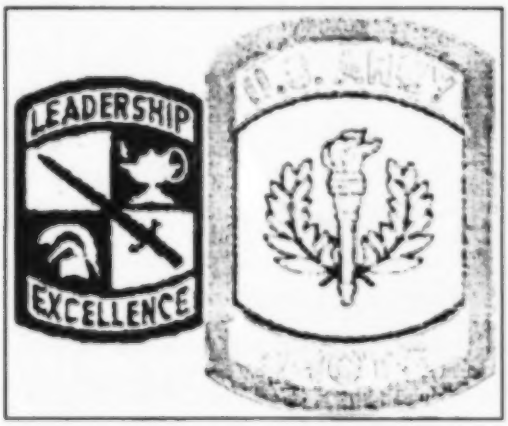

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Organization/Address: National Academy of Integrative Learning INC PO Box 5784 Hilton Head Island, SC 29938	Telephone: 843-686-4050 FAX: 843-686-4519 E-mail Address: nail@hargray.com Date: 10/09/02

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